Fish Parasite Monitoring as an Index of Stream Health in Point Reyes NS and Golden Gate NRA, California

Presenter:

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In Collaboration With

Anindo Choudhury, PhD, St. Norbert College, De Pere, WI and
Sibdas Ghosh, PhD, and James Cunningham, PhD,
Dominican University of California, San Rafael, CA

DOMINICAN UNIVERSITY of CALIFORNIA 1890

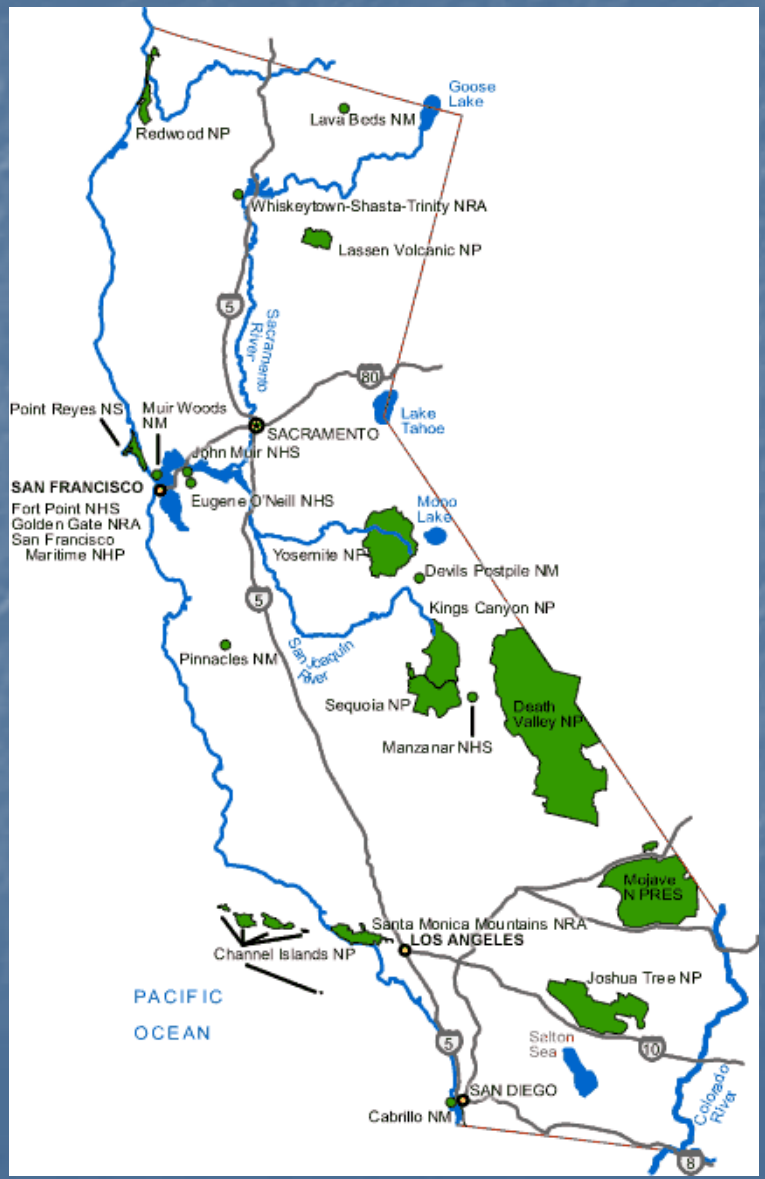
NATIONAL PARK SERVICE

Mietek Developed NPS Cooperative Agreement with Dominican Univ. of California (DU of C)

Current Volunteer and Funded NPS Projects with Faculty and Undergraduate Research Scholars:

- Three Senior Theses on Fish Parasites
- NPS Ocean Stewardship: Marine resources protection
- in NPS Units of Hawaii and California
- Best Management Practices for Equestrians in NPS Units
- Invasive plants spread by horse manure
- Bee biodiversity in central California NPS Units
- Sudden Oak Death

Fish Parasite Monitoring: an Index of Stream Health? in Point Reyes NS and Golden Gate NRA



- Map of CA NPS Units
- Study area of PORE and GOGA is located in San Francisco Bay Area Network of Parks

Fish Parasite Ecology Studies in CA National Parks

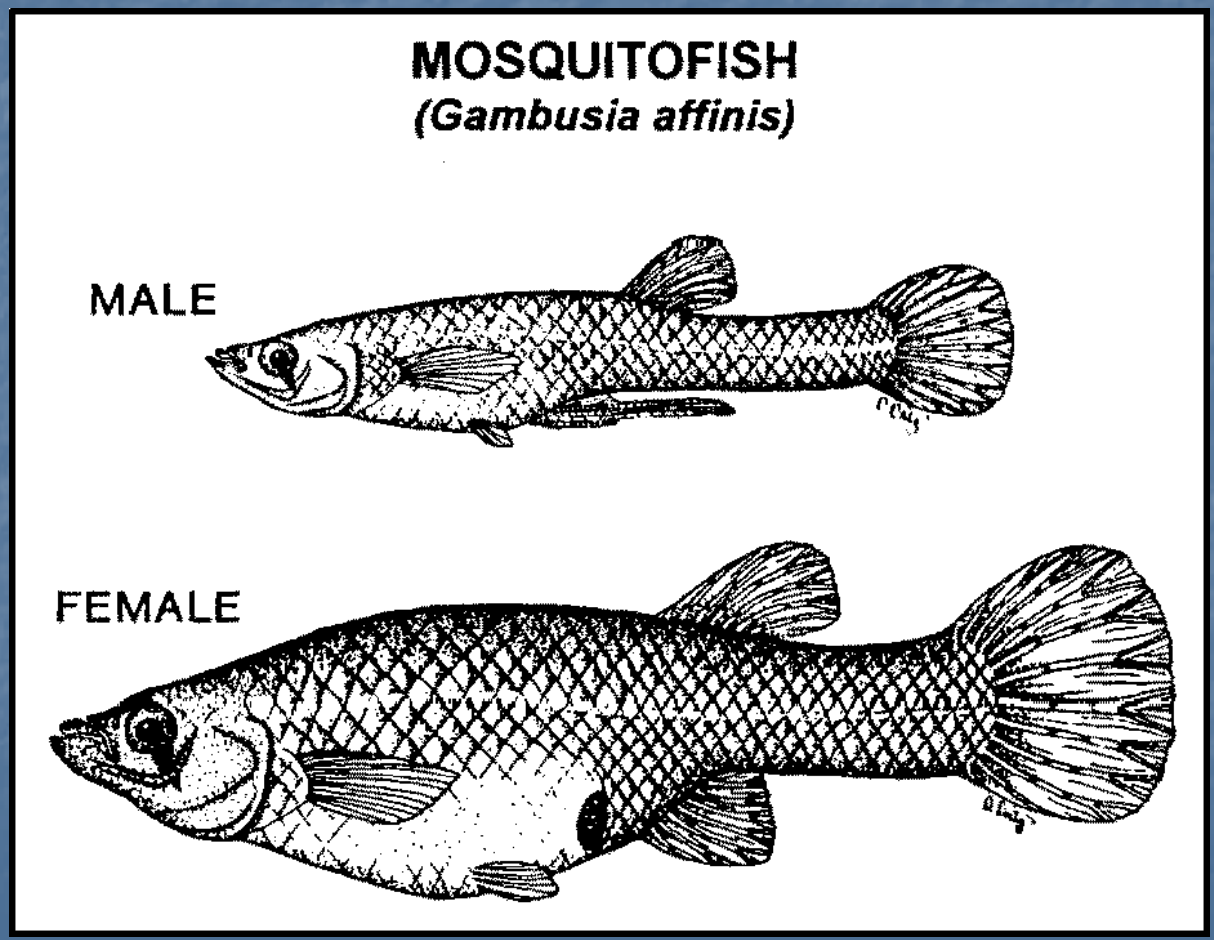
Cooperation among DU of C; St. Norbert College Division of Natural Sciences, De Pere, Wisconsin; and NPS

Research Scholar, Jan Marie Cheng (left) learning fish dissection techniques for detecting presence of parasites from Anindo Choudhury (at dissecting scope)

Darren Fong of GOGA (left) with fish collection team preparing for sampling in Rodeo Lagoon, GOGA,Marin County, CA

Darren Fong (left) and Research Scholar Collecting Three-spine Sticklebacks from Rodeo Lagoon in GOGA (also home of Endangered Tidewater Goby)

FIRST FISH PARASITE STUDY AT DU OF C and SNC:
ECOSYSTEM THREATS OF NON-NATIVE MOSQUITOFISH AND THEIR PARASITES TO NATURAL AREAS IN SAN FRANCISCO BAY AREA of CALIFORNIA



Undergraduate research scholars from DU of C received training in fish/Asian tapeworm research methodology at Verde River in Arizona

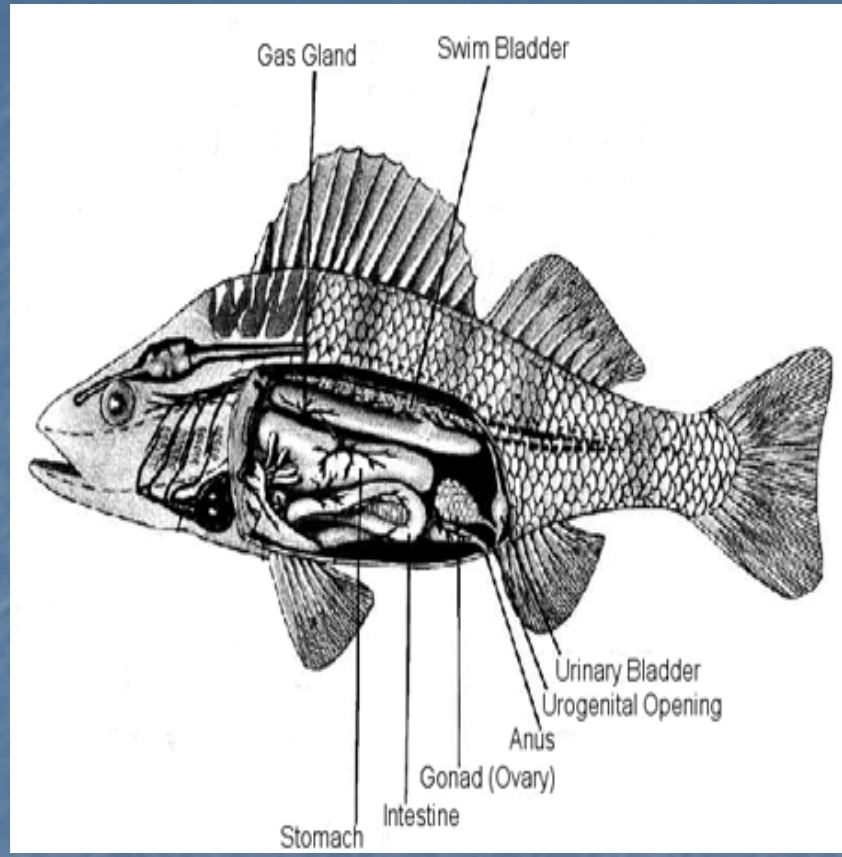
DU of C Student Parasite Pioneers:

Joyce Valencia
Rocky Chavez
Caitlin Sullivan
Marielle Discipulo

Training by Scott Bonar, PhD, and his research team from University of Arizona, Tucson (Spring 2004)

Examination, Dissection, and Data Base Protocols

- Source data on collected fish: (location, date, time, habitat, water salinity, etc.)



Examine exterior of fish and remove organs for detailed examination:

- Blood smear
- Gastrointestinal system
- Bladder
- Gills
- Eye sockets
- Coelomic cavity
- Liver

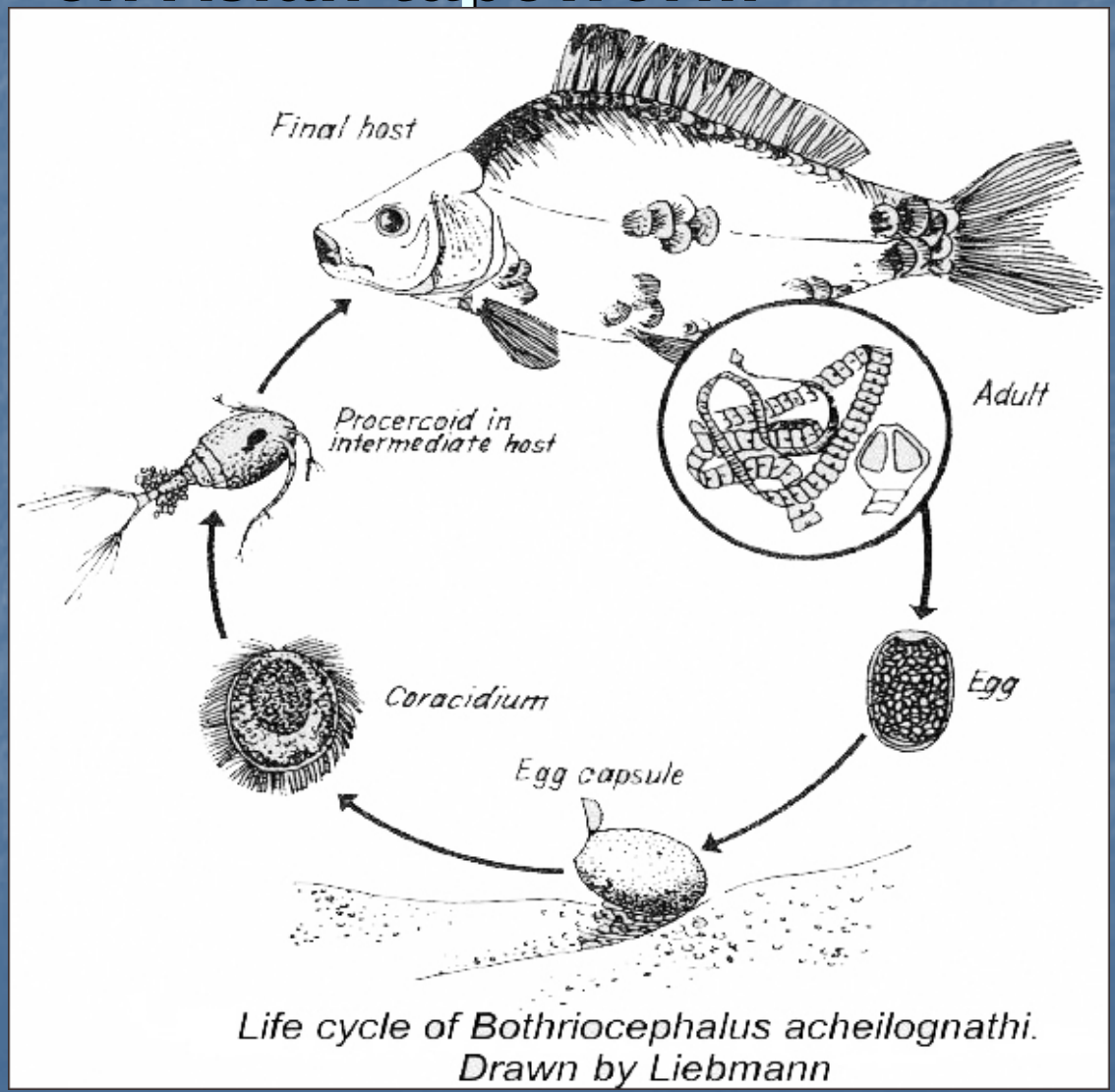
Record information on standard data sheet:

- Fish and parasite names
- Weight and length
- Location and number of parasites

Protocol developed by A. Choudhury

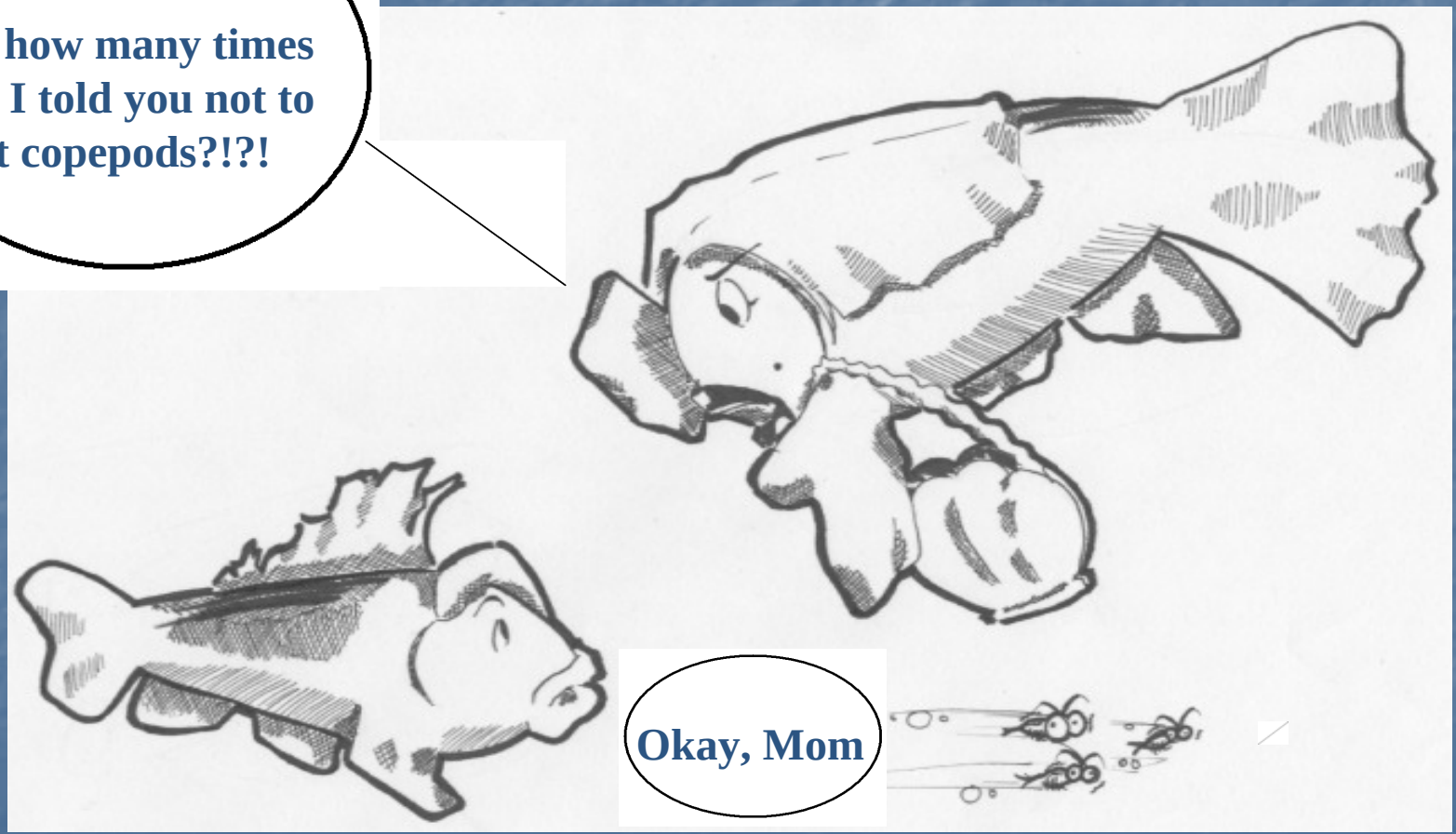
Study at Dominican began in 2004 as a general inventory of freshwater fish parasites with focus on Asian tapeworm

Several different copepod species can serve as intermediate hosts for this tapeworm



Life cycle of Bothriocephalus acheilognathi.
Drawn by Liebmann

In California Asian tapeworms have been found in endangered Mojave tui chub and mosquitofish in Mojave National Preserve and in other fish species in streams near San Diego, CA



Cartoon by Joyce Valencia, DU of C student

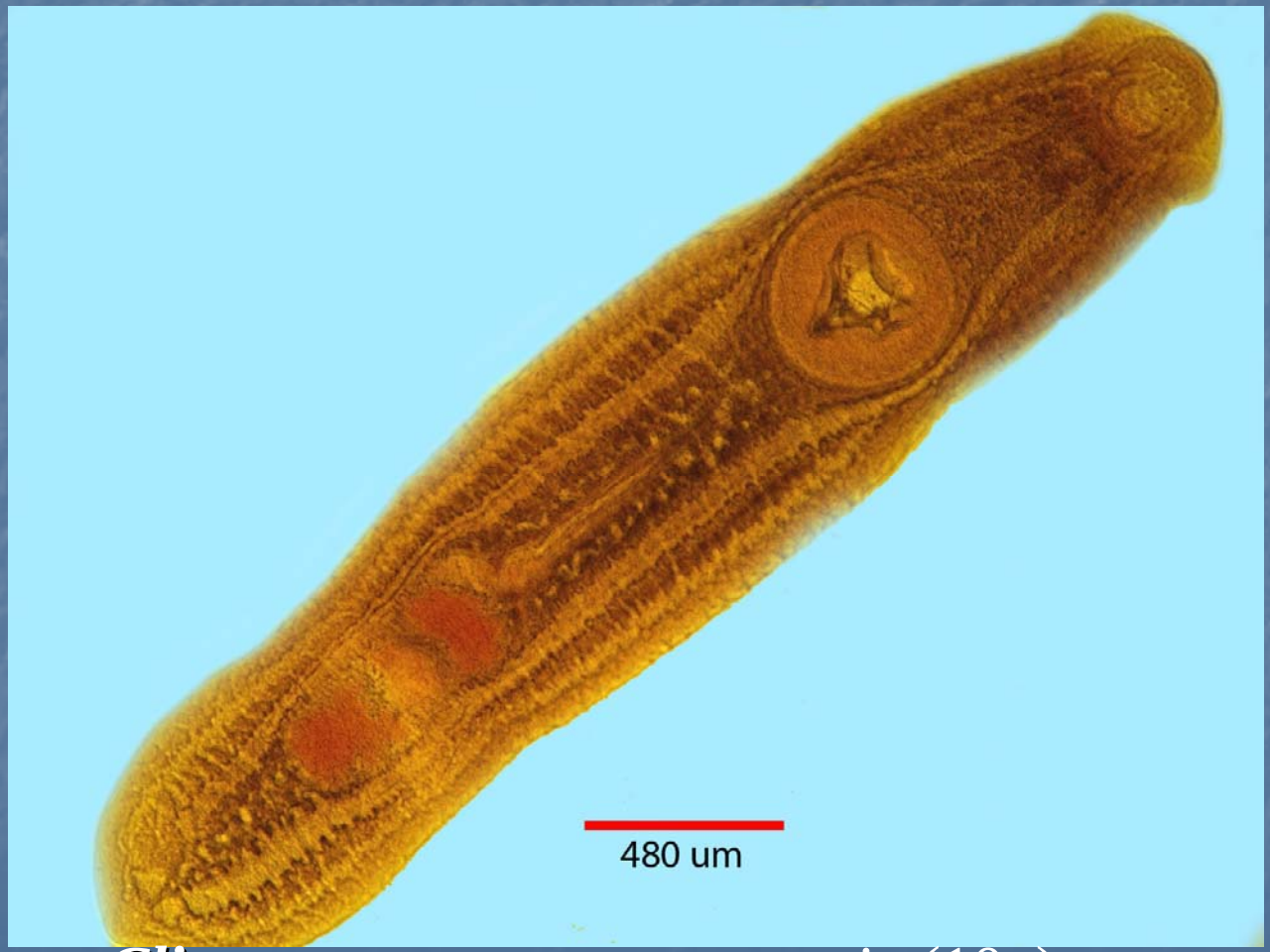
Impacts of exotic mosquitofish, *Gambusia affinis*, at Point Reyes NS and Golden Gate NRA

- Mosquitofish, non-native to California feed on native aquatic organisms, such as other fishes, larval amphibians, and larval insects

- Mosquitofish in PORE and GOGA host two parasites: one native, the other non-native...

(No Asian tapeworm found yet in PORE and GOGA)

Clinostomum sp. , yellow grub, found in SFO Bay Area mosquitofish is probably native



Clinostomum sp. metacercaria (10x)

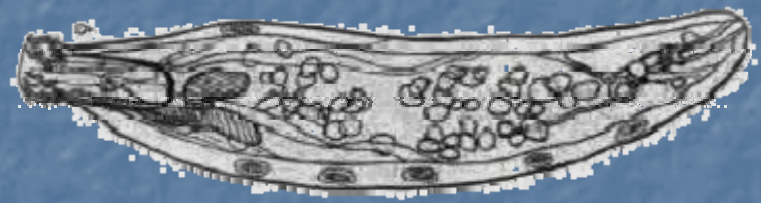
Identification and photo by A. Choudhury

Acanthocephalan from mosquitofish, *G. affinis*

Parasite and fish both non-native to California

Octospiniferoides chandleri

Identification and photo by A. Choudhury



Drawing of adult
O. chandleri

Head of *O. chandleri*

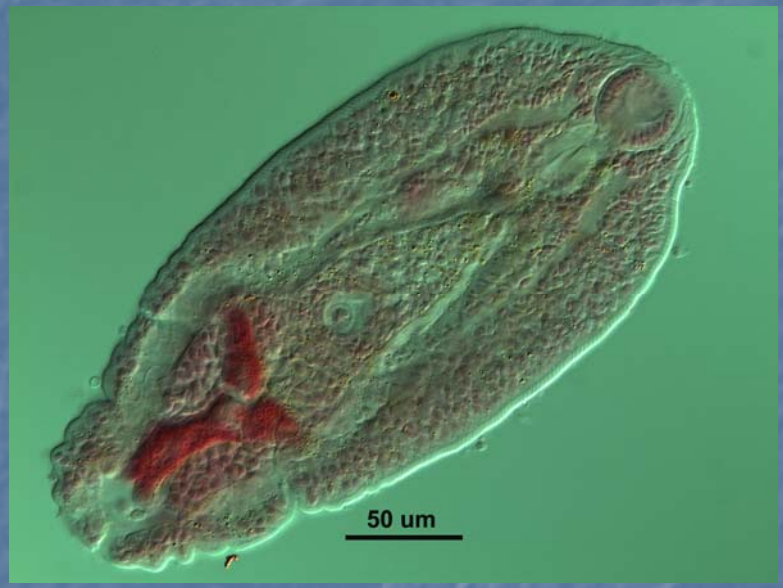
Recent and ongoing parasite studies at DU of C in San Francisco Bay Area

Other fishes studied: Three-spine stickleback, black bullhead catfish, prickly sculpin, and yellow-fin goby

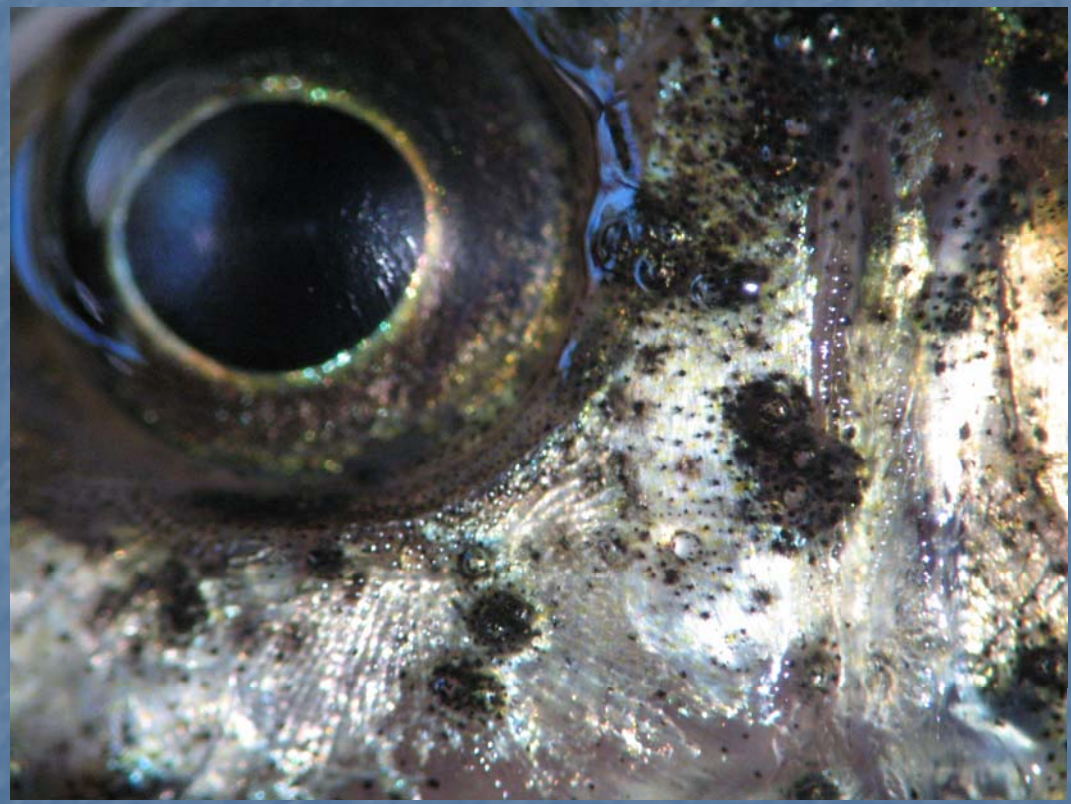
DU of C student, Chris Heiser (under cowboy hat) collecting fish with NPS staff in PORE

Three-spine stickleback at PORE and GOGA. This species bears 9 different parasite taxa, all new records in California

Three-spine stickleback, *Gasterosteus aculeatus*, afflicted with “black spot “



Cryptocotyle sp. (metacercaria)
causative agent of black spot



Note abundant black spots embedded on skin surface and invading eye tissue of this stickleback

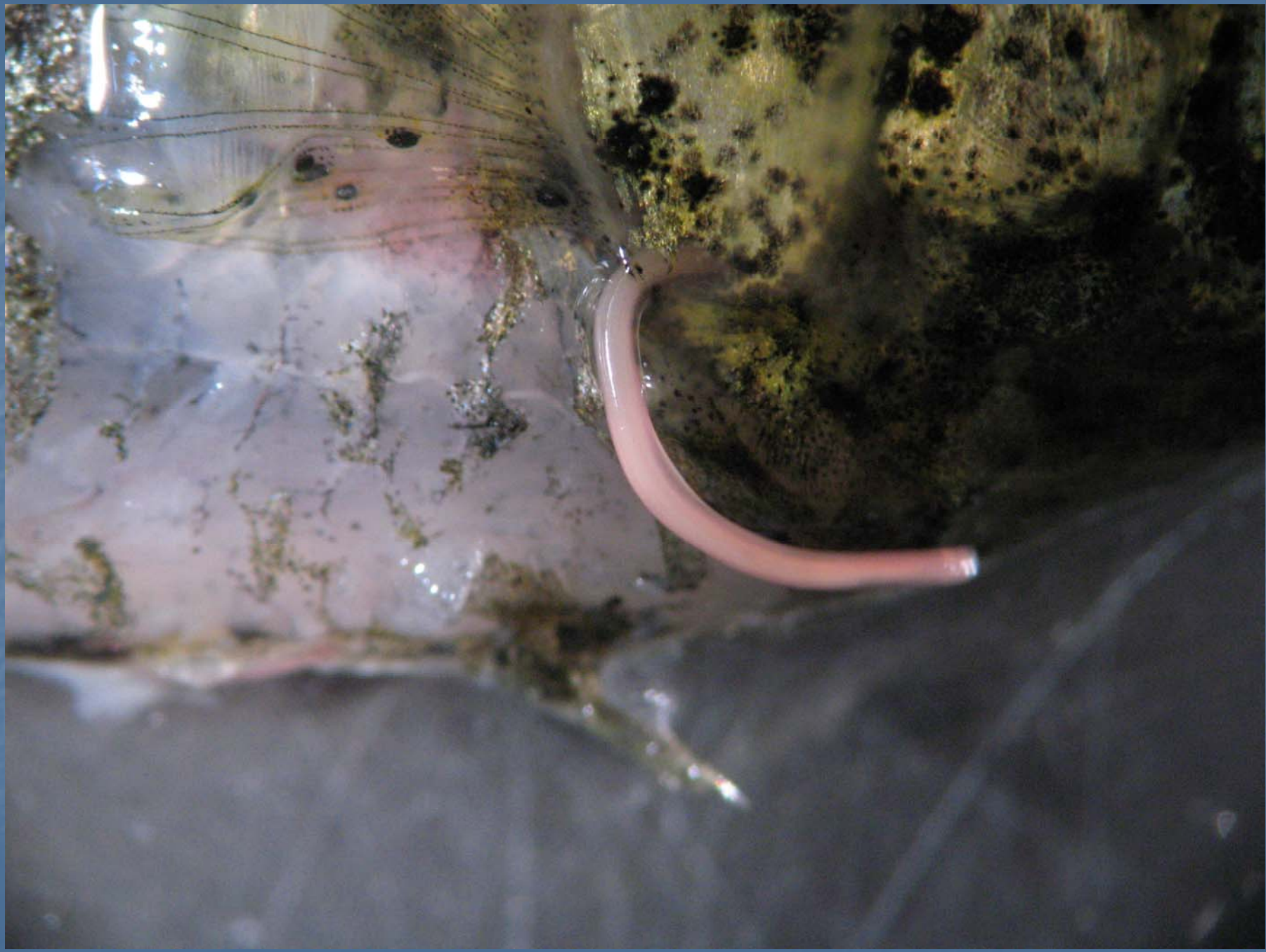
Three-spine stickleback is also afflicted with a new species of *Plagioporus*

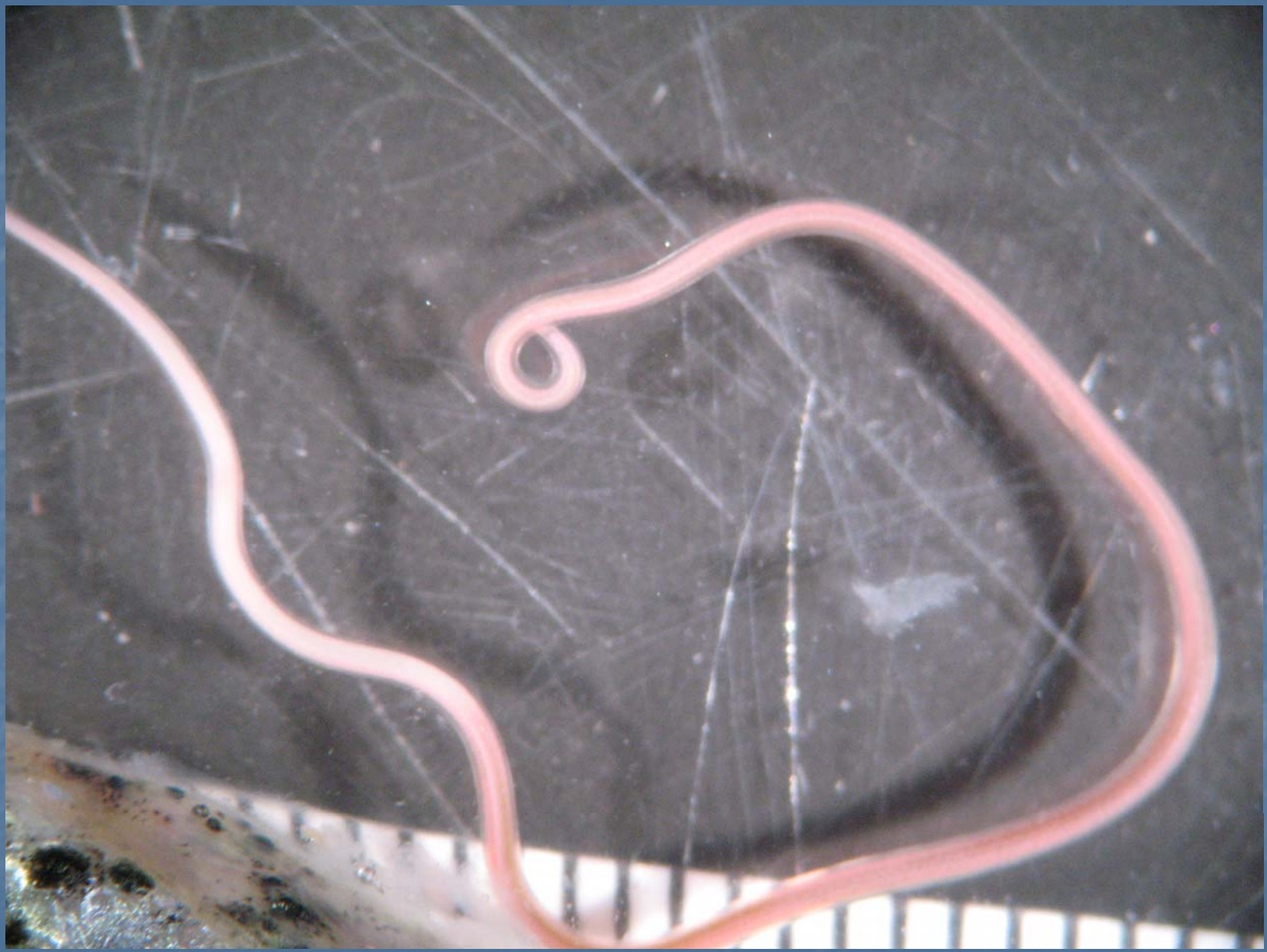
This species is new to science, being described, and will be published in a parasitology journal.

I appreciate the kindness of
Anindo Choudhury
in naming this species:

Plagioporus kolipinskii

Eustrongylides sp., another newly discovered helminth in three-spine stickleback



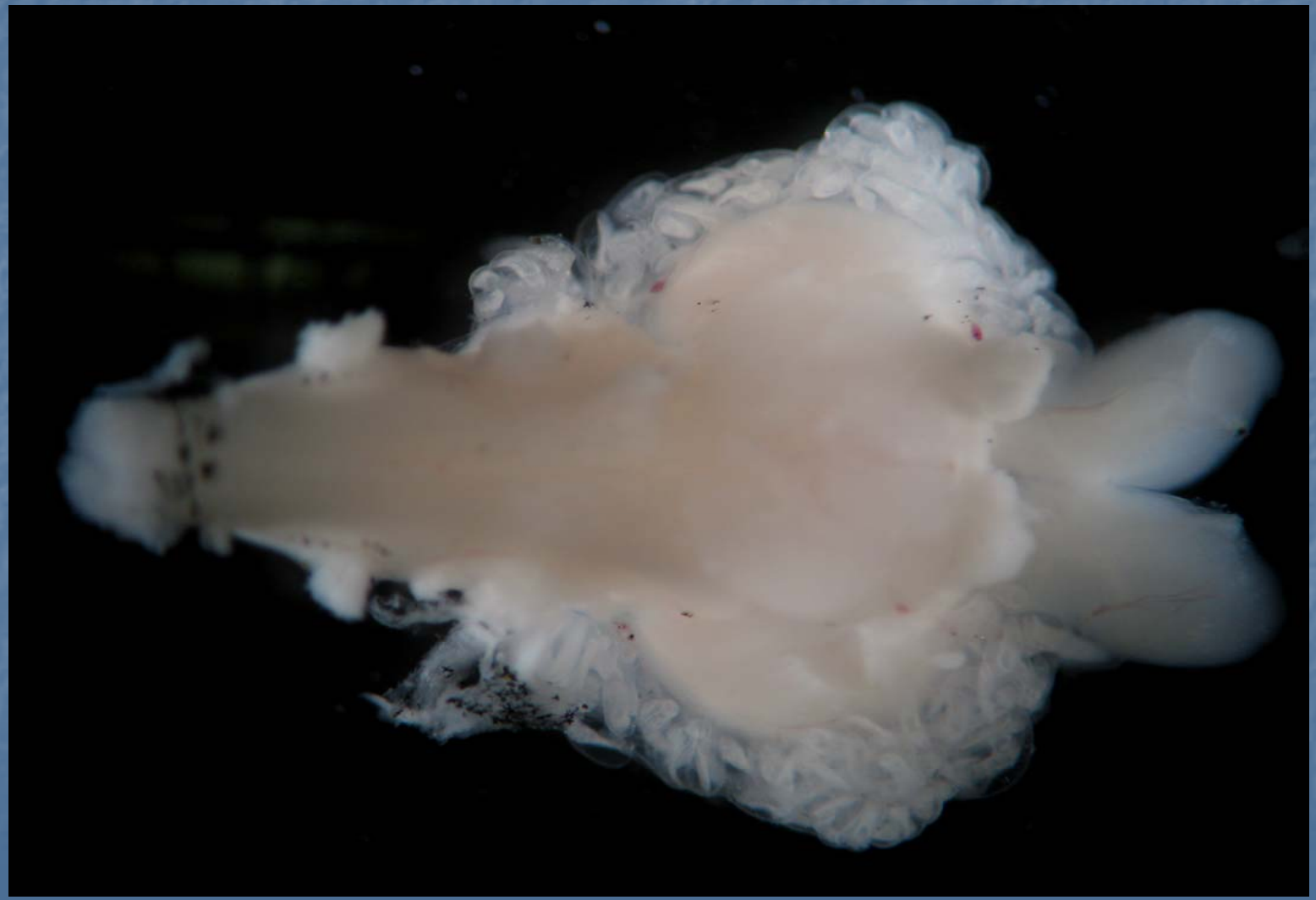


Ergasilus turgidus, a parasitic crustacean, found in abundance (typically hundreds) in gills of three-spine sticklebacks at GOGA and PORE

Parasites in sticklebacks from British Columbia (Campbell Creek) and from California (Lobos Creek, Giacomini Creek, and Rodea Lagoon). Ergasilus turgidus is included here for the sake of completeness. BW=Brackish water, FW=Freshwater Numbers in rackets indicate how many fish were examined from that location.

	Campbell Cr. (131)	Giacomini Cr. (FW) (29)	Giacomini Cr. (BW) (35)	Lobos Cr. (29)	Rodeo Lag. (47)
Cyathocephalus sp.	•				
Proteocephalus sp.	•	•			
Schistocephalus sp.	•	•			
Bunodera mediovitellata	•	• ?			
Plagioporus sp.				•	
Clinostomum sp.		•			
Neoechinorhynchus sp.	•				
"Black spot" Cryptocotyle sp	•			•	
Eustrongylides sp.	•			•	
Spirurida gen. sp.				•	
Ergasilus turgidus			•		•

Students discovered brain parasites in several fish species



Thanks to DU of C Students Currently Participating in Fish Parasitology Research

Sonia Flores
Sage Keleey
Ariana Martinez
Caitlin Sullivan